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Appendix B Add the following paragraph.

ELIMINATING STATIC BUILD-UP

If a static electrical charge builds up on the printer case, the paper may cling to the top of the printer case and prevent the paper from feeding through the printer. To remedy this condition, dampen a cloth with water and wipe the flat section of the printer case over which the paper travels as it feeds into the printer. Also wipe both sides of the printer lid. For a more permanent remedy to the problem, use a cloth that has been dampened with antistatic fluid. If a spray can is used to apply the antistatic fluid, temporarily cover the opening where the paper enters the printer to prevent the spray from entering the interior of the printer.

Appendix D Decimal values for hex codes AO through EF in Table D-2 are incorrect. Refer to a hex to decimal conversion table for the correct values.

Appendix F Delete the *Italic* column in the table.

THE WANG PROFESSIONAL COMPUTER

Matrix Printer
Manual

WANG

The Wang Professional Computer Matrix Printer Manual

**1st Edition — December, 1982
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WARNING

This equipment has been tested and found to comply with the limits for a Class B computing device in accordance with the specifications of Subpart J, Part 15, of FCC Rules. If this equipment should interfere with radio or television reception, the following corrective measures can be taken:

- reorient receiving antenna,
- relocate this device with respect to receiver,
- or plug this device into a different power circuit.

Further information is available from the US Government Printing Office, Washington, DC 20402, Document Stock #004-000-00345-4.

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CHAPTER 1 GENERAL DESCRIPTION

INTRODUCTION

The Wang Model PC-PM010 Dot Matrix Printer, shown in Figure 1-1, is an ideal printer for use with your Wang Professional Computer. It is intended for use with the many software applications available for the Professional Computer, including word processing, BASIC, and Multiplan. This printer couples innovative design and precision manufacturing with long life, low cost, light weight, and superior performance. The PC-PM010 features a 9-pin dot matrix print head, easily replaced by the operator, and 80 cps bidirectional printing with logic seeking or unidirectional printing capability.

This printer allows mixed printing of characters in any desired size (normal, enlarged, condensed, emphasized, etc.) on the same line. Another important feature is the capability of printing not only in both text and bit image modes but also in mixed text/bit image mode. A one-chip microcomputer performs all system control. The two built-in stepper motors control the carriage movement and paper feeding functions. Software-controlled features include form feed, programmable line spacing, skip-over perforation, underlined printing, and superscript/subscript printing. The printer contains an adjustable sprocket pin-feed paper drive, for printing on continuous forms, and a friction drive for printing cut sheet paper.

The Professional Computer user manuals contain detailed information on using the printer as an output device for word processing, BASIC, Multiplan, and other programs.

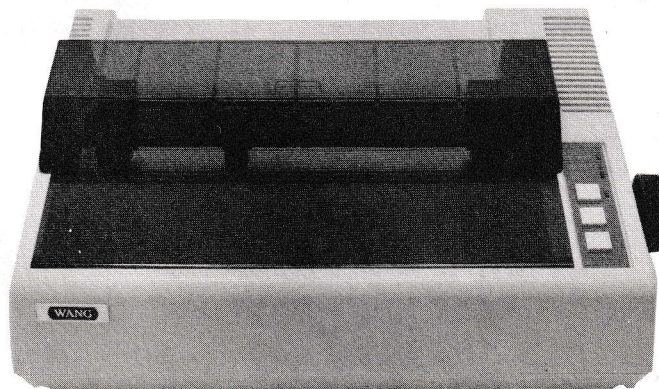


Figure 1-1 Model PC-PM010 Dot Matrix Printer

General Description

CHARACTERISTICS

The Model PC-PM010 provides versatile functions to meet a wide range of business applications. The following is a brief summary of printer characteristics.

Both text printing (for word processing and general data processing) and bit image printing for graphic data processing are freely available. Bit image printing refers to the hard-copy production of illustrations, graphs, and charts on the printer by activating the print head wires under software control.

In the text printing mode, underlined printing and superscript/subscript printing modes are software selectable.

In the bit image printing mode, both normal density (480 dots/line in horizontal direction) and dual density (960 dots/line in horizontal direction) modes are software selectable.

The printer allows a wide variation of printing width and character sizes.

- 40 characters/line (enlarged character)
- 66 characters/line (enlarged-condensed character)
- 80 characters/line (normal character and emphasized character)
- 132 characters/line (condensed character)
- Programmable column length

A wide selection of functions are included in the printer.

- Top of Form - page length setting in line or inch units
- Skip-over perforation - automatic skip-over function is software selectable
- Programmable line spacing
- Horizontal tabulation
- Buzzer function

The printer's bidirectional printing with logic seeking capability results in a high throughput. Unidirectional printing is software selectable.

The Model PC-PM010 has an easy-to-replace "throwaway" print head that has a life expectancy of approximately 100×10^6 characters. Standard printer equipment includes a paper end detector, ribbon cartridge, and a paper separator.

General Description

CHAPTER 2 INSTALLING THE PRINTER

UNPACKING

Before removing the Model PC-PM010 from the carton, check the box for evidence of shipping damage or mishandling. If such evidence is present, notify the carrier immediately.

Unpack the printer as follows:

1. Open the printer shipping carton.
2. Remove the accessories.
3. Remove the printer by holding its underside and lifting it straight up with the packing material attached.
4. Place the printer with the packing material on a table or any other convenient flat surface.
5. Take off the packing material carefully.
6. Remove the vinyl cover.

REPACKING

Repack the printer by reversing the above steps. Save all original packing materials for reuse.

COUNTING THE PARTS

The Wang Model PC-PM010 Matrix Printer and standard accessories are listed below, and shown in Figure 2-1.

Matrix Printer
Paper Separator
Ribbon Cartridge

Power Cord
Connecting Cable to Professional Computer
User Manual

Installing the Printer

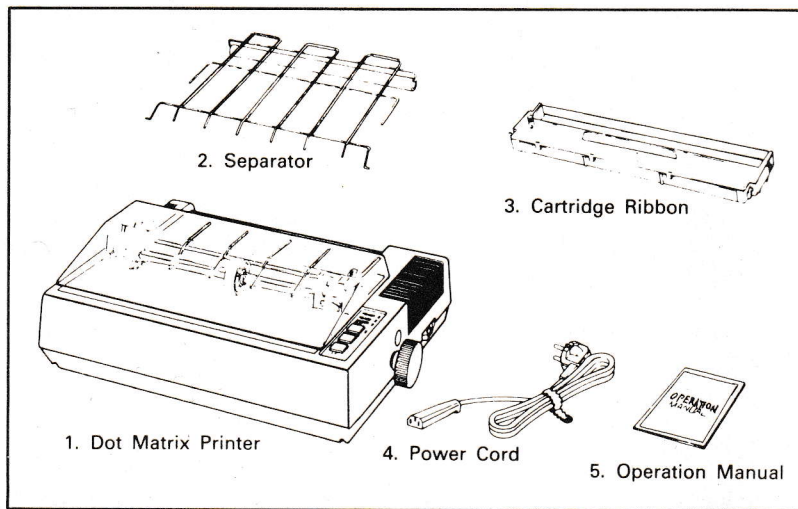


Figure 2-1 Contents of Carton

PRINTER PLACEMENT

Place the printer next to the Professional Computer on a desk, tabletop or any other convenient flat surface, with enough room for the separator in the back of the printer. The printer has rubber feet that will not mar the mounting surface.

Avoid operating the printer in places where it may be exposed to direct sunlight or where greasy dust exists in the air. Greasy dust may cause the print head to malfunction.

Do not subject the printer to temperatures below 5°C (41°F) or above 35°C (95°F) during operation, to sudden changes in temperature, or to extreme shock. Avoid using the printer in a humid location, or near a heater.

The PC-PM010 is provided with a protective paper inserted between the inner and outer paper guides to protect the paper end detector from damage due to shock or vibration during transportation. Before using the printer, be sure to remove this paper. Return the paper to its original position before shipping the printer.

Installing the Printer

Shipping screws are installed in the printer prior to shipment to protect the unit against any damage that may be caused by shock or vibration. Before operating the printer, remove the screws as described below.

1. Turn the printer over and place it on a soft, padded surface.
2. Using a medium blade Phillips screwdriver, remove the two shipping screws visible on the underside of the printer. See Figure 2-2. Save the shipping screws for future use. The screws must be reinstalled in the printer prior to shipment.

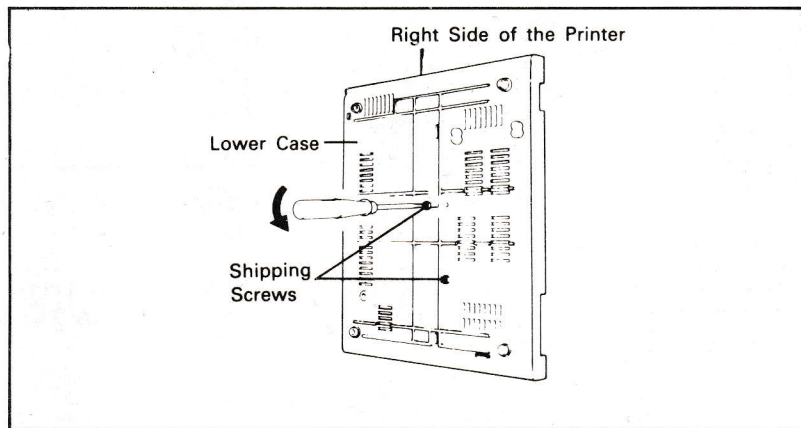


Figure 2-2 Removing Shipping Screws

REMOVING AND INSTALLING THE PRINTER LID

The lid must be removed when changing the ribbon cartridge and when changing the paper supply. Keep the lid on the printer at all other times to reduce the buildup of dust and other contaminants in the mechanism, and thereby prolong printer life. Rough or careless handling of the lid may damage or break it. Remove the printer lid using the following procedure.

1. Place the printer on a flat surface and raise the lid to the fully vertical position. It is important that the lid be in the vertical position to avoid damage to it.
2. Lift the left end of the cover, then the right end. The cover is now free of the printer. See Figure 2-3.

Installing the Printer

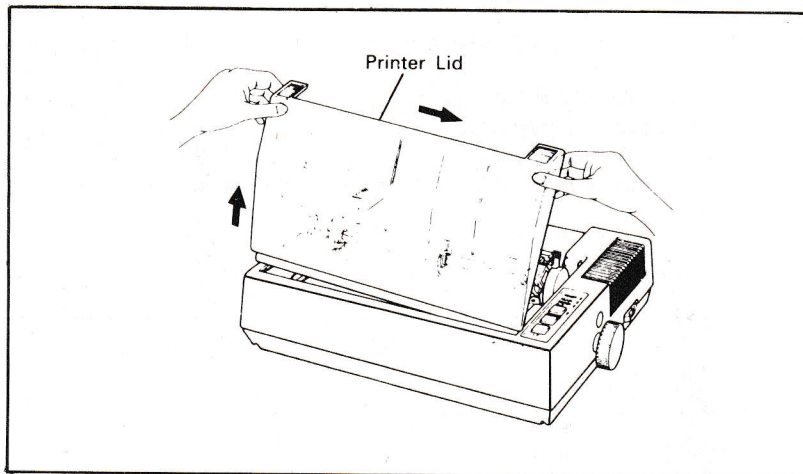


Figure 2-3 Removing the Printer Lid

3. To install the cover, hold the cover vertically and lower the right end, then the left end onto the printer, as shown in Figure 2-4.

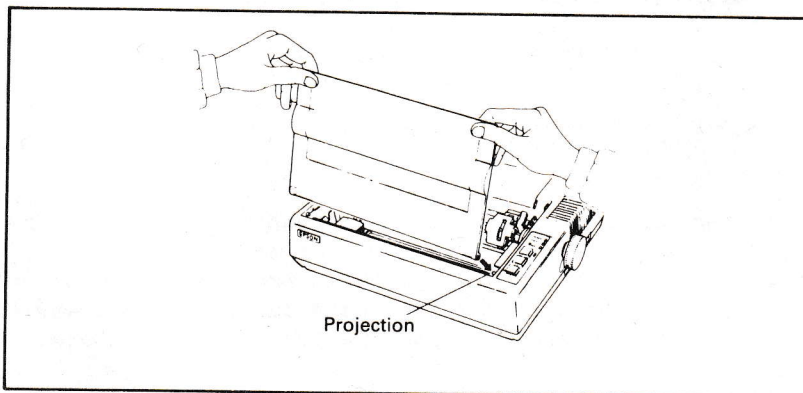


Figure 2-4 Installing the Printer Lid

Installing the Printer

SEPARATOR INSTALLATION

The paper separator contributes to smooth paper feeding. Install the separator by inserting the two angled ends of the separator into the two holes located in the printer frame, behind the paper tractor unit, as shown in Figure 2-5. Position the rectangular-shaped wire bracket above the separator, not below it.

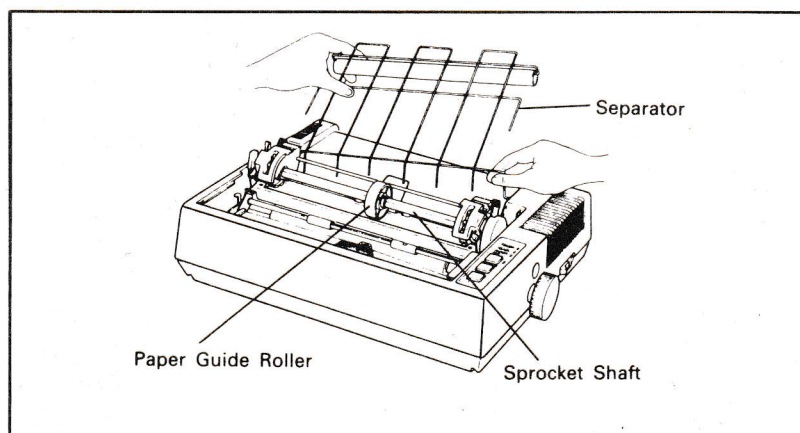


Figure 2-5 Separator Installation

POWER CABLE CONNECTION

The Printer is capable of operating on one of the following three types of AC power.

- o 115V AC, 60Hz
- o 220V AC, 50Hz
- o 240V AC, 50Hz

Before connecting the printer to a power source, check the voltage and frequency rating on the label located on the rear panel of the printer. If your PC-PM010 Printer has a voltage or frequency rating different from that of the available power source, do not attempt to operate the Printer.

NOTE:

Connect the power cord to an outlet separated from those connected to electrical noise-generating equipment, such as large-power motors, refrigerators, etc.

SIGNAL CABLE CONNECTION

Connect one end of the supplied signal cable, Part No. 220-0105-4, to the multi-pin connector at the rear of the printer. Connect the other end of the cable to the multi-pin connector that is closest to the cooling fan on the rear panel of the Professional Computer. Using a small flat-blade screwdriver, tighten the two retaining screws on each connector so that the connectors are locked into place. If these screws are left loose the printer may not operate, and damage to the connectors may result.

CHAPTER 3 PRINTER OPERATION

This section contains information on printer controls and indicators, and how to install the ribbon cartridge and paper.

SWITCHES AND INDICATORS

There are three switches and four indicators on the control panel and one power switch on the right side of the printer case. In this section, panel operating procedures are described in sufficient detail for you to become familiar with the printer. The control panel is shown in Figure 3-1.

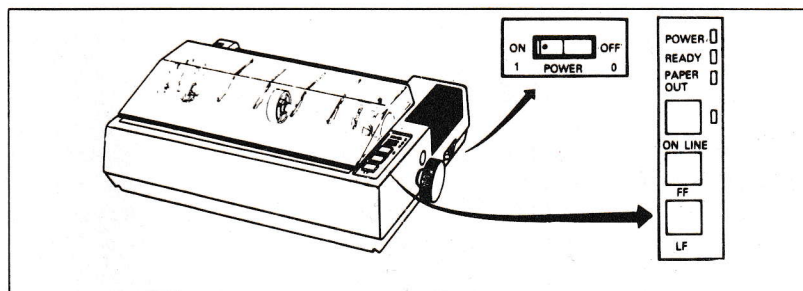


Figure 3-1 Control Panel Switches and Indicators

Switches

POWER Switch: Controls primary AC power to the Printer.

NOTE:

Before turning this switch on, check to see that paper is installed in the printer. Incorrect paper installation of the may prevent the printer from operating properly.

Printer Operation

ON LINE Switch When the power is turned on after paper is loaded, the printer enters the ON-LINE mode and is ready for use with the Wang Professional Computer.

Pressing the ON LINE switch sets the printer in the off line mode and causes the green LED to go out. The switch does not function while the printer is printing.

The printer is automatically placed off line if the paper supply is exhausted or if a mechanical error occurs in the printer.

The operations of the Line Feed and Form Feed switches are effective only while the printer is OFF LINE.

FF Switch: Pressing this switch advances the paper vertically to the next Top of Form position. This switch works only when the printer is off line.
(Form Feed)

The Top of Form position is automatically set when the POWER switch is turned on. Before turning the POWER switch on to start operating the printer, set the paper at the appropriate Top of Form position.

LF Switch: The paper advances as long as this switch is pressed. When this switch is pressed momentarily, the paper advances 1/6 inch.
(Line Feed)

The line feed operation is prohibited during printing.

Indicators

POWER : Illuminates while the Printer is receiving AC power.
READY : Illuminates when the Printer is ready to receive data.
PAPER OUT : Illuminates when the paper supply is near its end.
ON LINE : Illuminates when the Printer is in the ON-LINE mode.

Buzzer

The buzzer is located inside the printer case. It sounds for about 0.3 second when the Printer receives the BEL code CHR\$(7).

PAPER CONTROLS

Paper Release Lever

The paper release lever is located at the left end of the platen. The lever is set to the forward (release) position when using pin-feed paper. The lever is set to the rearward position when using cut sheet paper.

Printer Operation

Gap Adjustment

The 7-position control lever shown in Figure 3-2 enables printing on single sheets of paper as well as multiple copy forms. This control moves the print head toward or away from the paper. The control setting affects print quality to some degree.

- o For ordinary single-sheet paper, set this control at about the fourth step (the middle position). For heavy weight paper, move the lever forward one or more steps.
- o For multiple copy forms, set the lever to the fully forward position (seventh step). Multiple copy forms should consist of one original and one or two carbon copies, total thickness not to exceed 0.3 mm (0.012 in.).
- o If printed characters become lighter due to the use of the printer for an extended period, move the head adjusting lever backward (in the - direction) one step. See Figure 3-2.
- o When a set of carbon paper sheets is used, be sure that no characters are printed within the area two lines above and below the perforation.

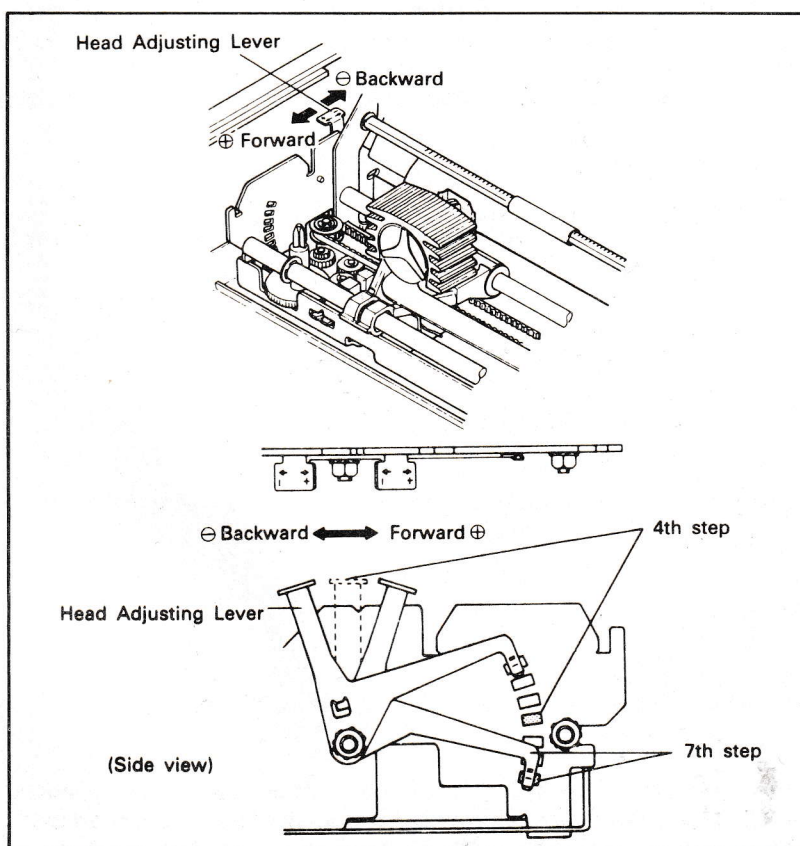


Figure 3-2 Gap Adjustment

Printer Operation

Paper End Detector

The paper end detector stops the printer and lights the Paper Out indicator when the end of paper occurs. For continuous form paper the detector operates when near the end of the last page of continuous forms. For single-sheet paper the detector operates at 0.3 in. (7.5 mm) from the bottom of the page.

When the end of paper condition occurs, the printer is automatically switched to OFF-LINE. The remaining paper can be removed from the printer by pressing the LF switch. After installing paper in the printer, press the ON LINE switch to resume printing.

The paper end detection function prevents continued operation when the printer is out of paper. If you want to print several additional lines on the paper past the point where the end detector normally stops the printer, enter control code ESC8 to disable the end detector.

SELF-TEST

The PC-PM010 has a self-test function to check print quality and overall printer operation. The self-test function is preprogrammed and can be performed by turning the POWER switch on while pressing the LF switch. All characters provided by the internal software are printed out on the paper by this operation.

The self-test function cannot be performed when the printer is out of paper.

```
!"#$%&'()*+,-./0123456789:;<=>?@ABCDEFGHIJKLMNPOQRSTUVWXYZ[\]^_`abcdefghijklmnopqrstuvwxyz{|}~0123456789:;<=>?@ABCDEFGHIJKLMNPOQRSTUVWXYZ[\]^_`abcdefghijklmnopqrstuvwxyz{|}~0
```

RIBBON CARTRIDGE REMOVAL AND INSTALLATION

The ribbon cartridge is compact, long-lasting, and very easy to install and remove.

Cartridge Removal

1. Set the printer power switch to the OFF position, and remove the printer lid.
2. Check to see that the paper scale (the metal bar with the numbers 1 to 80 printed on it) is positioned against the platen. If it is in the forward position push it back against the platen.

Printer Operation

3. Hold the ribbon cartridge by the vertical fin on the top of the cartridge, and lift it clear of the printer. See Figure 3-3.

Cartridge Installation

1. Set the Printer power switch to the OFF position, and remove the Printer lid.
2. Check to see that the paper scale (the metal bar with the numbers 1 to 80 printed on it) is positioned against the platen. If it is in the forward position push it back against the platen.
3. Hold the ribbon cartridge by the vertical fin in the center of the cartridge. Lower the ribbon cartridge into the printer so that the two tabs on the ends of the cartridge fit into the slots on the printer frame. Press the cartridge firmly into place and turn the knob on the cartridge in the direction of the arrow to remove any slack in the ribbon (see Figure 3-3).

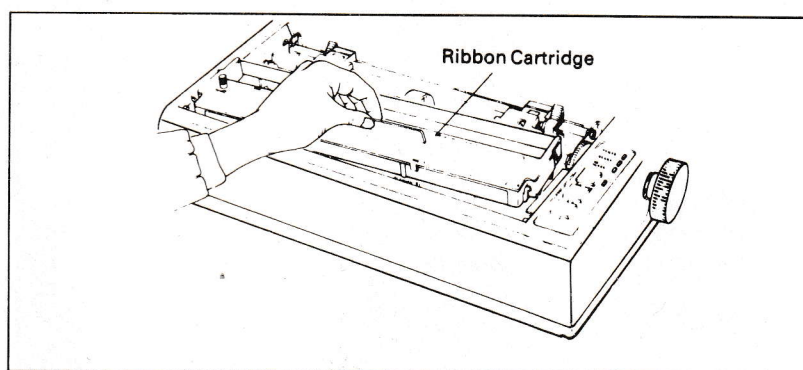


Figure 3-3 Ribbon Cartridge

5. Using a pencil (or your fingers), lift the ribbon into the slot between the print head and the ribbon mask, as shown in Figure 3-4. Turn the knob on the cartridge to remove any slack in the ribbon.

Printer Operation

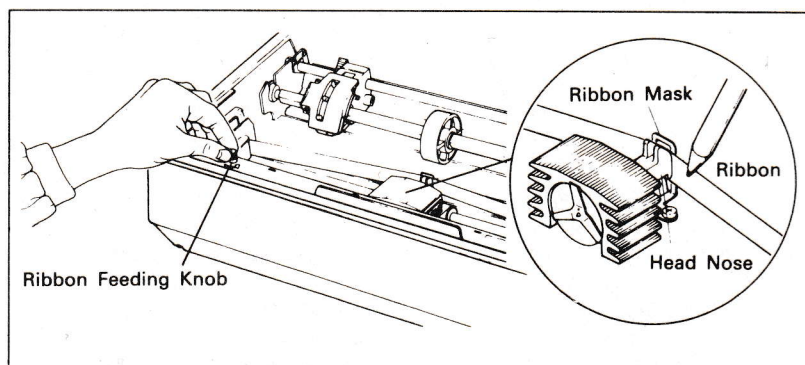


Figure 3-4 Positioning the Ribbon

6. Confirm that the ribbon is not twisted or creased. Incorrect ribbon installation may cause the ribbon to come off the print head (see Figure 3-5).

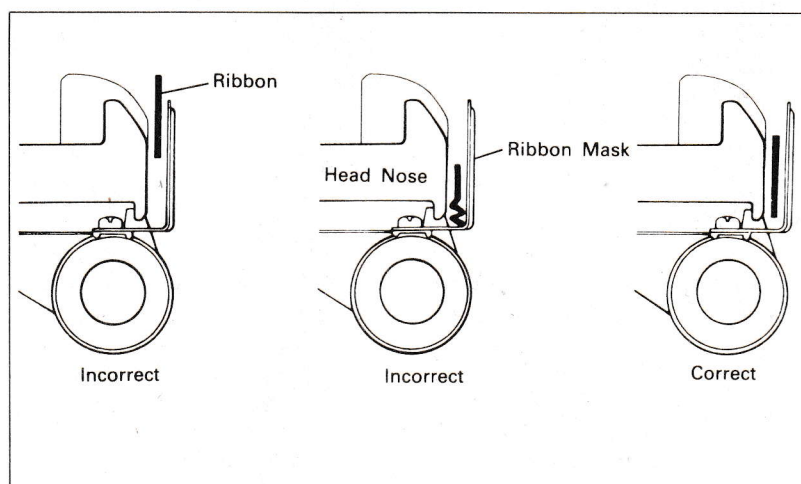


Figure 3-5 Examples of Correct and Incorrect Ribbon Position

FANFOLD PAPER

The printer accepts fanfold pin-feed paper 4 in. (10.2 cm) to 10 in. (25.4 cm) wide. The use of pin-feed paper enables continuous printing, and provides accurate paper positioning.

Loading fanfold paper

1. Set the Printer power switch to OFF, and remove the printer lid.
2. Unlock the release lever by pulling it in the direction of the arrow. See Figure 3-6.
3. Pull the paper scale toward the front of the printer, away from the platen, and center the paper guide roller on the sprocket shaft.

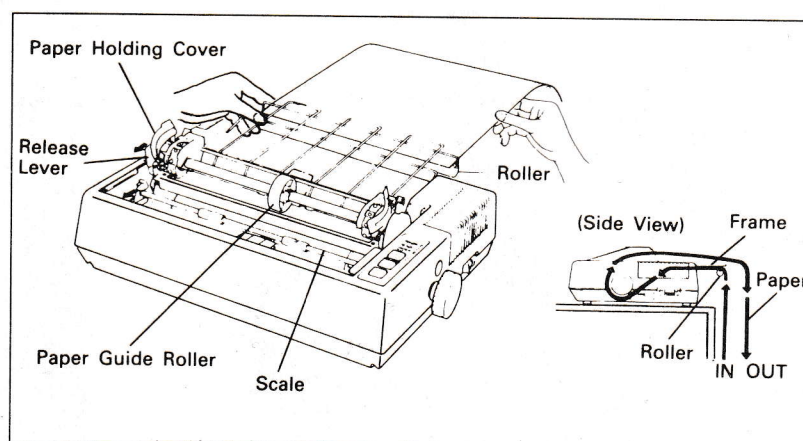


Figure 3-6 Inserting Fanfold Paper

4. Open the two paper holding covers. Insert the end of the forms between the separator frame and the separator roller. See Figure 3-6. Guide the forms into the slot under the separator, and up in front of the paper tractors.
5. Position the holes on the left and right edges of the paper over the pins on both sprockets. See Figure 3-7. If necessary, pull the two sprocket lock levers forward, and move the sprockets to the left or right so that the sprocket pins enter the holes in the paper edges.

Printer Operation

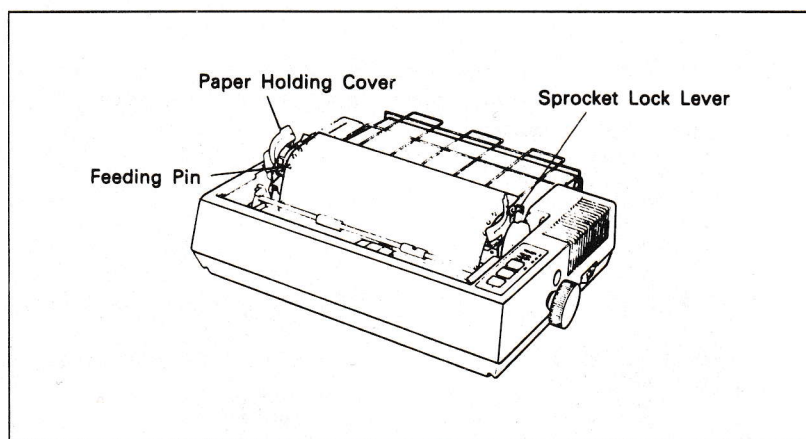


Figure 3-7 Positioning of Paper on Sprockets

6. Push the paper scale up against the paper, and adjust the paper tension. Push the paper holding covers down into place. Push the two sprocket lock levers to the rear (only if they were pulled forward in step 5).
7. Install the lid on the printer. The printer is now ready to use (see Figure 3-8).

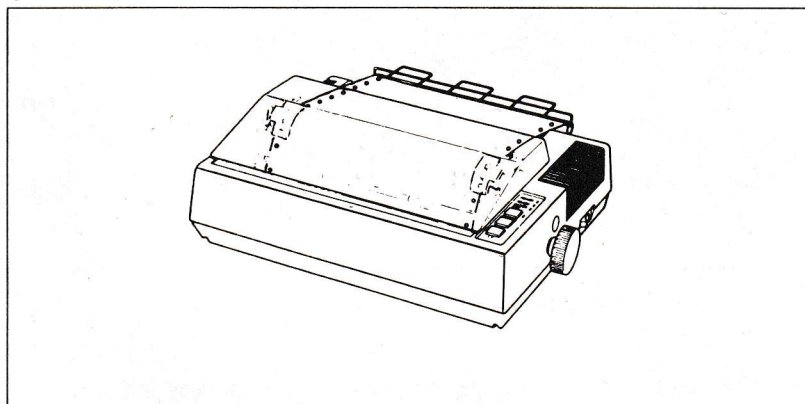


Figure 3-8 Printer with Fanfold Paper Installed

NOTE:

When the PC-PM010 Printer is to be used on a desk or a bench, arrange the fanfold paper as shown in Figure 3-9. This permits the paper to be folded in an accordion style.

Printer Operation

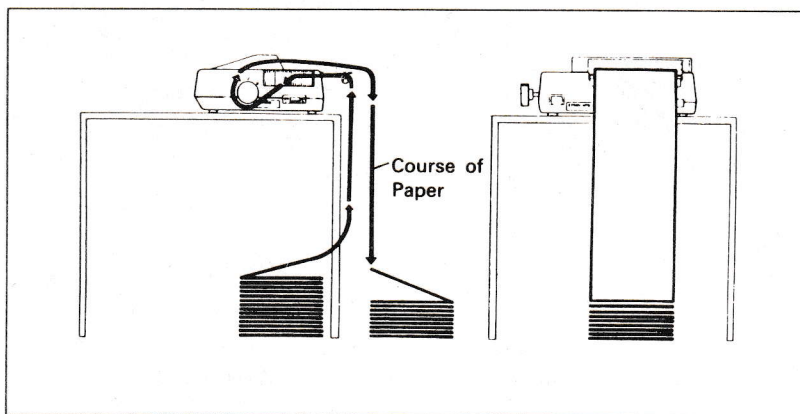


Figure 3-9. Fanfold Paper Supply and Takeup

Removing Fanfold Paper

To remove the fanfold paper from the printer, tear off the paper along the perforations on one of the sheets that supply the printer. With the printer off line, press the LF button until all the paper is out of the printer. The paper can also be removed by switching the printer power off, and rotating the knob at the end of the platen.

CAUTION

Do not attempt to rotate the knob when power is applied to the printer, or to pull out the paper in the backward direction. Damage to the printer may result.

Column Layout on Fanfold Paper

The print position 1 on the paper is the home position of the print head. It is also indicated by the number 1 on the print scale. To move the location of print position 1 on the printed page, unlock the sprocket lock levers and position the sprockets to the left or right as required. Lock the levers and check the print position on the paper. Readjust if necessary.

Printer Operation

Top of Form Position

The Top of Form position is the position of the first print line on the form. This position is automatically set each time that the printer power is turned on. With the printer power off, adjust the paper position by the manual paper feed knob so that the first line position is at the top edge of the ribbon. When power is applied to the printer, this line position automatically becomes the Top of Form position.

Printer Operation

The matchmarks located on both the sprockets also facilitate the setting of the Top of Form position on fanfold paper. To set the Top of Form position, first enter (or preprint) a mark at a position on the edge of the paper 4-1/8 inches (105 mm) above the first print line position of the paper, then align this mark with the matchmarks on the sprockets by turning the manual paper feed knob (with printer power off). See Figure 3-10. At this point, turn the Power Switch on and the Printer will recognize this position as the Top of Form position.

When the Professional Computer sends an end of page command to the printer, the paper is advanced to the top of form position on the next page.

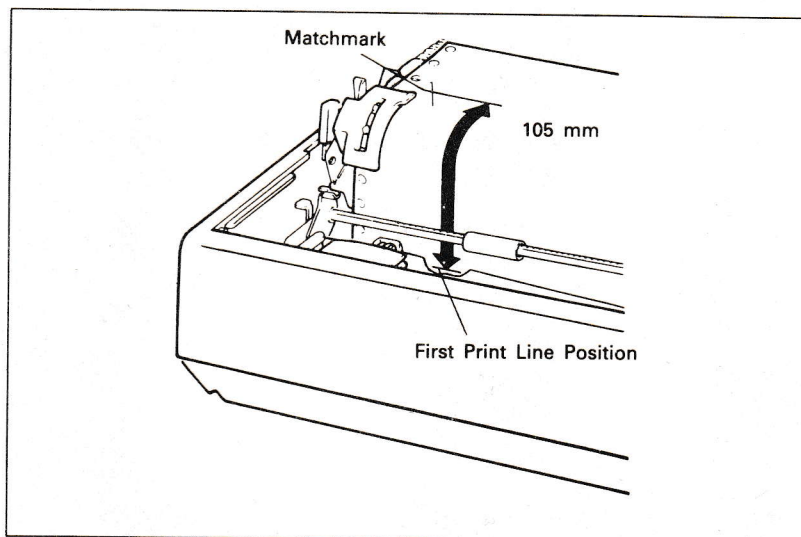


Figure 3-10 Top of Form Position

CUT SHEET PAPER

Cut sheet paper is readily loaded into the printer. Cut paper is preferred when printing a single page, or when printing letterheads. The PC-PM010 accommodates cut paper sheets measuring 8.3" to 8.5" in width.

Loading Cut Sheet Paper

1. Shut off printer power, and raise the printer lid.
2. Push the release lever rearward. See Figure 3-11.

Printer Operation

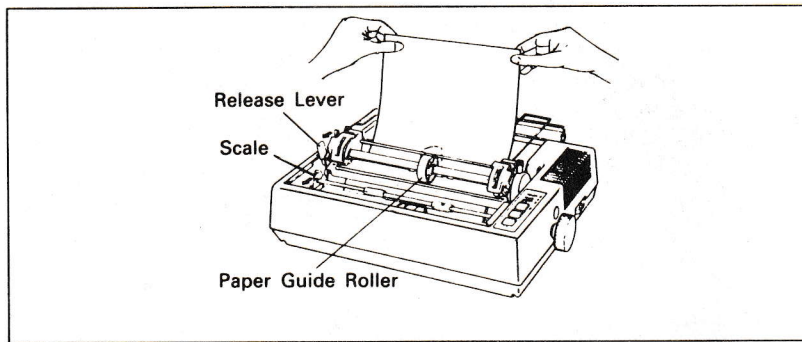


Figure 3-11 Loading Cut Sheet Paper

3. Pull the scale toward the front of the printer to detach the scale from the platen. See Figure 3-11.
4. Confirm that the paper guide roller is at the center of the sprocket shaft. If not, set it at the center of the shaft. The paper guide contributes to smooth paper feeding.
5. Insert the cut paper sheet between the paper guides at the rear of the printer.

NOTE:

Remove the paper separator to simplify paper loading when using cut sheet paper.

6. While applying slight pressure on the paper so that it aligns squarely against the platen, rotate the paper knob clockwise to advance the paper around the platen and up in front of the print head. See Figure 3-12.

Printer Operation

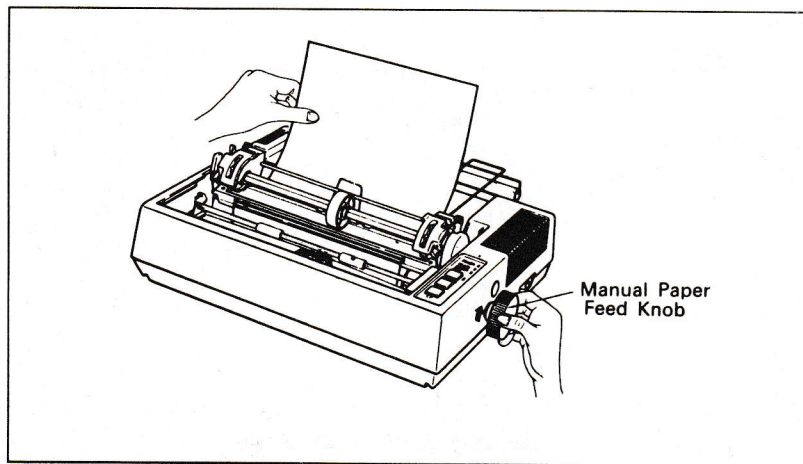


Figure 3-12 Adjustment of Paper

7. If the cut paper sheet or form is long enough, unlock the release lever and align the side edges of the paper as shown in Figure 3-13.

Printer Operation

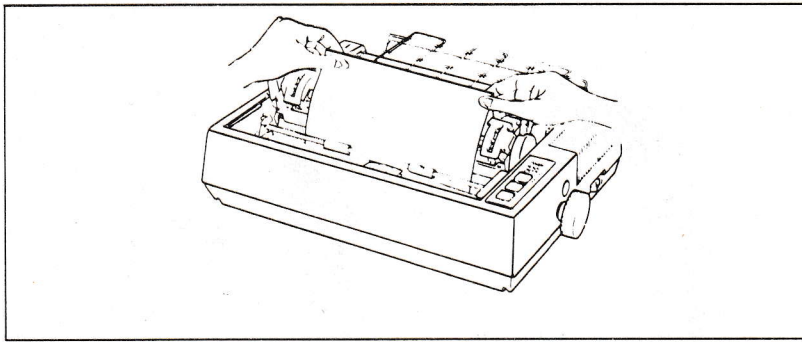


Figure 3-13 Alignment of Side Edges

8. If the cut paper sheet or form is not long enough to align the side edges, align the top edge of the paper with the reference lines on the tractor unit. See Figure 3-14.

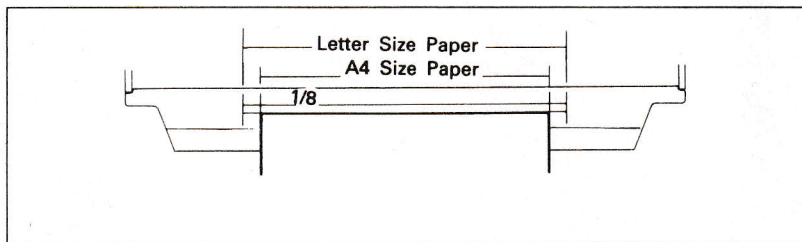


Figure 3-14 Tractor Unit Reference Lines

9. Push the scale back into position and install the lid on the Printer. See Figure 3-15. The print area on the cut paper sheet (when printing it with the tractor unit installed) is shown in Figure 3-16.

Printer Operation

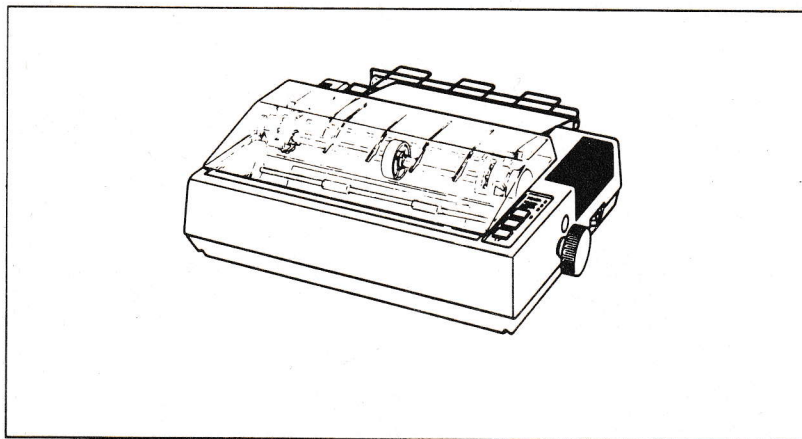


Figure 3-15 Printer with Cut Sheet Paper Installed

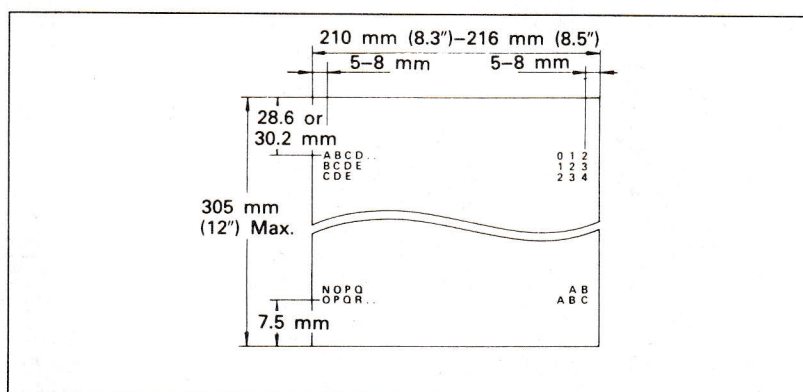


Figure 3-16 Print Area

NOTE:

The Paper End Detector normally causes printing to stop at a point .3" (7.5 mm) from the paper bottom edge.) The Paper End Detector function can be disabled under software control (ESC 8). If the paper is set on the line marked 1/4 as shown in Figure 3-14, then the printing starts from a position 28.6 mm below the top edge of the paper. If the paper is set on the line marked 1/8, then the printing starts from a position 30.2 mm below the top edge of the paper.

MOUNTING AND DISMOUNTING THE TRACTOR UNIT

The tractor unit is removable so that individual sheets of paper can be easily fed through the printer. Use the following procedure to remove the tractor.

1. Release the lock levers of the tractor unit by pulling them forward, as shown in Figure 3-17.
2. While holding the lock levers in the forward position, tilt the tractor unit toward the rear of the Printer, then gently lift it clear of the Printer.

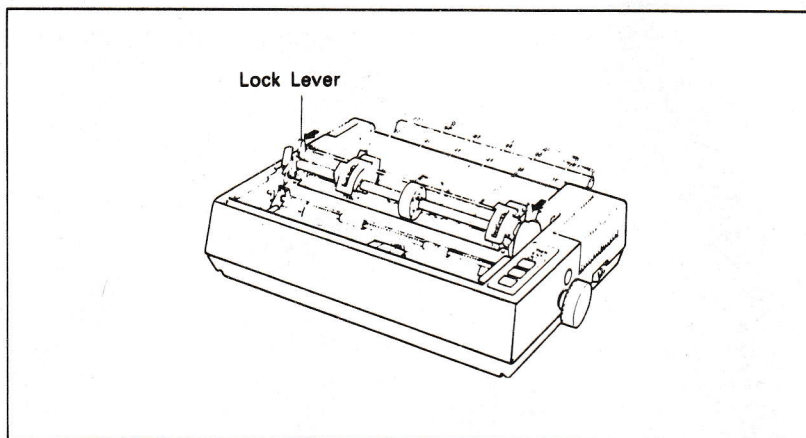


Figure 3-17 Removing Tractor Unit

3. To install the tractor unit, carefully lower the tractor unit onto the printer so that the U-shaped notches on the ends of the tractor frames fit onto the shaft at the locations shown in Figure 3-18. Tilt the tractor unit forward until it locks into place.

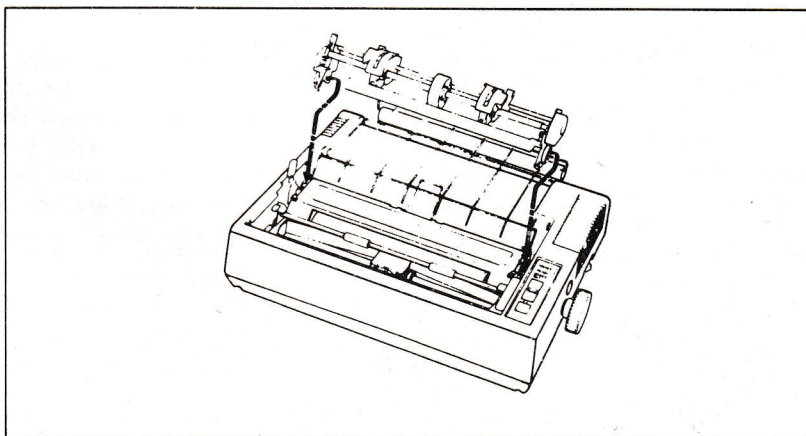


Figure 3-18. Mounting Tractor Unit

Printer Operation

CHAPTER 4 CONTROL CODES

DEFINITION OF TERMS

If you are already familiar with the following terms, skip this paragraph.

- . ASCII code
- . Escape codes
- . "+" symbol
- . 2, D and H

ASCII Code

Characters in computer systems are represented by groups of bits. The various groups of bits that represent the set of characters that are the "alphabet" of any given system are called a "coding system," or simply "code." Code for representing the information vary in relation to both the number of bits used to define a single character in the assignment of bit patterns to each particular character. In US ASCII (The United States of America Standard Code for Information Interchange) code the bit group $(01000001)_2 = (65)_{10}$ represents the character "A".

The Printer has 223 character set and control codes. Alphabets, numbers and special symbols are addressed from $(32)_{10}$ to $(222)_{10}$.

Control Codes

Printer Control codes are addressed from $(0)_{10}$ to $(27)_{10}$, also $(127)_{10}$. The control codes and their decimal values are listed in Appendix E.

Escape Codes

Many of the printer control codes are escape (ESC) codes, and are listed in Appendix E. Escape codes are entered in two parts. The first part is `CHR$(27)` which prepares the printer to accept an escape control code. The second part is the letter, number, or symbol that designates the escape control code itself, such as "A", "C" or "D". Or, you can enter the decimal value for the control code from Appendix E. For example, the decimal values for escape codes "A", "C", and "D" are 65, 67, 68, which are entered in a program line as `CHR$(65)`, `CHR$(67)`, and `CHR$(68)`.

Control Codes

"+" symbol

You will see "+" symbol often in the explanation or description of control codes in this manual. Do not add this symbol to your program._

2, D (or Decimal) and H (or Hexadecimal)

()2, ()D and ()H respectively represent binary, decimal and hexadecimal numbers.

n(D)

Many of the printer codes require the operator to enter an "n" value in the program line, in decimal form. The "n" value is preceded by a CHR\$ code.

PRINTER OPERATING MODES

Two standard operation modes are available with the Wang Model PC-PM010 Matrix Printer: Text and Bit-Image. Text Mode prints characters on normal ASCII coded inputs. Bit Image Mode prints pictures and images in dot configurations. Control codes for both operating modes are given in this chapter.

CONTROL CODES IN THE TEXT MODE

The PC-PM010 is designed as a terminal unit capable of various software controls. When control codes are transferred to the Printer, respective functions governed by these codes such as form feed, line feed, etc. are executed immediately. In this section, the control codes in text mode are classified into groups.

- . Print action codes
 - CR carriage return
 - LF Line feed
 - FF Form feed
 - ESC < Home head
- . Paper formatting control codes
 - Horizontally
 - ESC D, HT Tabulation
 - ESC Q Column length
 - Vertically
 - ESC Ø, ESC 1, ESC 2,
 - ESC 3 + n, ESCA, Line spacing
 - ESC C, FF Form length, form feed
 - ESC N, ESC O Skip-over perforation

Control Codes

CHAPTER 4 CONTROL CODES

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 - Horizontally
 - ESC D, HT Tabulation
 - ESC Q Column length
 - Vertically
 - ESC Ø, ESC 1, ESC 2,
 - ESC 3 + n, ESCA, Line spacing
 - ESC C, FF Form length, form feed
 - ESC N, ESC O Skip-over perforation

Control Codes

. Character designation codes	
SO, ESC W, DC 4	Enlarged character printing
S1, DC 2	Condensed character printing
ESC E, ESC F	Emphasized character printing
ESC G, ESC H	Double printing
ESC S, ESC T	Subscript/superscript printing
ESC -(minus)	Underline printing
. Other codes	
ESC @	Printer initialization
ESC 8, ESC 9	Selection or deselection of the paper end detector
BEL	Bell
BS	Back space
DEL	Delete
NUL	Null
ESC K, ESC L	Access code to Bit Image mode (described later).
ESC U	Unidirectional printing set, reset
ESC >, ESC =	MSB set, reset
ESC #	MSB value unchanged

PRINT ACTION CODES

CR (Carriage Return)

The CR Code causes all data stored in the print buffer to be printed and a carriage return to be executed. At the same time that the CR code is received, a line feed LF code is also received from the computer that advances the paper one line after the execution of printing by the CR code.

NOTE:

When 80 columns of print data (including spaces) are received, and the data is valid and printable, the printer automatically prints the data stored in the print buffer. If no data precedes the CR code, or if all preceding data consists of spaces, the carriage return is not executed. When all 80 columns of data are spaces, the carriage return is not executed. Under this condition, if AUTO FEED XT is at "LOW" level, only paper feeding is performed.

LF (Line Feed)

The LF code causes the printer to print all data in the print buffer and advance the paper one line.

NOTE:

If no data precedes the LF code, or if all preceding data is SPACE, only line feed occurs. For example, if the data is transferred in the order of DATA CR LF, data will be printed by the CR code, and when the Printer receives the LF code, it only carries out one line feed, because no print data precedes the LF code.

Control Codes

VT (Vertical Tabulation)

This code functions the same as when the LF code is input.

FF (Form Feed)

The FF codes causes the Printer to execute the printing of all data stored in the print buffer and advances the paper to the next predetermined Top of Form position.

ESC < (Home Head)

Input of ESC code causes the print head to return to the home position (left end) and prints the current line unidirectionally, from left to right.

PAPER FORMATTING CODESHT (Horizontal Tabulation)

The HT code carries out the horizontal tabulation to a predetermined position set by "ESC D" (up to 28 positions) or set by a default value (every 8 columns in case of the default setting). In the absence of any predetermined HT position, the HT code will be ignored. In enlarged character mode, two non-enlarged characters correspond to one enlarged character.

ESC D + n1 + n2 + + nk + NUL

n = 1 to 80 in normal character mode
n = 1 to 132 in condensed character mode
k = 28 maximum

This codes specifies the horizontal tab stop positions. "n" denotes column position where the print head stops. The first 28 tab stops per line are recognized in the Printer, and subsequent tab stops are ignored. The tab stop positions can be specified up to 80 columns in normal character mode and 132 columns in condensed character mode.

In enlarged character mode, two non-enlarged characters must be set as one character.

The NUL code should be input as the command for the termination of the tab set sequence, and the lack of this code will cause incorrect data printout.

PROGRAM EXAMPLE

```
10 LPRINT CHR$(27);CHR$(68);CHR$(5);
20 LPRINT CHR$(10);CHR$(21);CHR$(0);"ABC";
30 LPRINT CHR$(137);"DEF";CHR$(137);"GHI";
40 LPRINT CHR$(137);"JKL"
```

```
ABC  DEF  GHI      JKL
```

Control Codes

EXAMPLE

```

200 LPRINT "AAAAAAA" : LPRINT "BBBBBBB"
210 LPRINT "CCCCCCC"
220 LPRINT CHR$(27); "A"; CHR$(24);
230 LPRINT "DDDDDDD"; LPRINT "EEEEEEE";
240 LPRINT CHR$(27); CHR$(2)
250 LPRINT "FFFFFFF"

```

```

AAAAAAA }
BBBBBBB } 12/72" = 1/6" line spacing
CCCCCCC }
DDDDDDD }
EEEEEEE } 24/72" = 1/3" line spacing
FFFFFFF

```

ESC 0

The ESC 0 code causes the subsequent line spacing to be set at 1/8 inch.

EXAMPLE

```

10 REM Set Line Spacing at 1/8 inch
20 LPRINT CHR$(27); "0";
30 FOR I=1 TO 8
40 LPRINT "Line Spacing at 1/8 inch"
50 NEXT
60 END

```

```

Line Spacing at 1/8 inch
Line Spacing at 1/8 inch
Line Spacing at 1/8 inch
Line Spacing at 1/8 inch
Line Spacing at 1/8 inch
Line Spacing at 1/8 inch
Line Spacing at 1/8 inch
Line Spacing at 1/8 inch

```

Control Codes

ESC 1

The ESC 1 code causes the subsequent line spacing to be set at 7/72 inch.

EXAMPLE

```

10 REM Set Line Spacing at 7/72"
20 LPRINT CHR$(27); "1";
30 FOR I=1 TO 5
40 LPRINT "Line Spacing at 7/72 inch"
50 NEXT
60 LPRINT :LPRINT
70 LPRINT CHR$(27); "@";
80 FOR J=1 TO 5
90 LPRINT "Printer Initialization"
100 NEXT
110 END

```

```

Line Spacing at 7/72 inch
Line Spacing at 7/72 inch
Line Spacing at 7/72 inch
Line Spacing at 7/72 inch
Line Spacing at 7/72 inch

```

```

Printer Initialization
Printer Initialization
Printer Initialization
Printer Initialization
Printer Initialization

```

ESC 2

The ESC 2 code causes the subsequent line spacing to be set at 1/6 inch.

ESC 3 + (n)D

The ESC 3 + (n)D code causes the subsequent line spacing to be set at $n/216$ inch. The limits of (n)D are from 1 to 255.

With (n)D=1 and (n)D=2, paper feeding accuracy is not guaranteed. If the value of n is set to 0, this setting is ignored and the value of n set immediately before this code becomes valid.

EXAMPLE

```

10 REM Set Line Spacing at n/216
20 FOR N=10 TO 20
30 LPRINT CHR$(27);"3";CHR$(N)
40 LPRINT "line spacing ";N;"/216 inch"
50 NEXT
60 END

```

```

line spacing 10 /216 inch
line spacing 11 /216 inch
line spacing 12 /216 inch
line spacing 13 /216 inch
line spacing 14 /216 inch
line spacing 15 /216 inch
line spacing 16 /216 inch
line spacing 17 /216 inch
line spacing 18 /216 inch
line spacing 19 /216 inch
line spacing 20 /216 inch

```

ESC C + (n)D

This code specifies how many lines are to be printed on a form. The minimum number (n) is 1, and the maximum is 127. In other words, the maximum form length is 127 lines. The amount of line spacing when this code is input is a predetermined numerical value by ESC A + (n)D. When the form length is not programmed by the ESC C + (n)D code, one page is assumed as 11 inches.

ESC C + (0)D + m

This code specifies the absolute quantity of form length in units of inches, where m = from 1 to 22. Even if the amount of line spacing is changed on the page, the absolute quantity of form length remains unchanged. The value "m" denotes the form length in inches.

NOTE:

The ESC C + (n)D code defines the form length by the number of lines using the amount of line spacing set by the ESC A + (n)D code. The ESC C + (0)D + m code defines the form length as an absolute quantity in inches. The ESC C code cancels the skip-over perforation set by ESC N.

ESC N + (n)D (for setting skip-over perforation)

The ESC N + (n)D code is used to set the skip-over perforation function. This function specifies the number of lines "n" to be skipped at the bottom of a page (n is any value from 1 to 127). For example, if you want to skip the last three lines on a page, the value of n must be entered as 3. If the value of n set is greater than the form length specified by the ESC C + (n)D code, skip-over perforation is executed up the first line of the next page after one line printing. If the value of n is set as 0, this setting is ignored and the value of n set immediately before it becomes valid.

When the current form length is changed by the ESC C + (n)D or ESC C + (0)D + (m)D code again, the amount of skip-over perforation previously set is cancelled. In this case, therefore, the ESC N + (n)D code must be input again to set the amount of skip-over perforation.

ESC O

This code cancels the skip-over perforation set by the ESC N + (n)D code.

Character Designation Codes

SO (Shift Out) (for enlarged characters)

The SO code causes all the following data on the same line to be printed in double-width, enlarged characters. This code is cancelled by the line feed or the DC4 code. SO can be specified at any column position on a line.

Therefore, normal size and enlarged characters can be mixed on the same line.

NOTE:

With normal size and enlarged characters mixed on the same line, when any enlarged character is at the 79th column position in terms of normal size character, this position becomes the end position of the line (i.e., "Print Buffer Full" position).

EXAMPLE

```
300 LPRINT "ABCD";CHR$(14);"EFGH"
310 LPRINT "IJKL";CHR$(14);"MNOP"
```

```
AB C D E F G H
I J K L M N O P
```

SI (Shift In) (for condensed characters)

The SI code causes all data stored in the buffer to be printed. The following data is printed in condensed characters. This code is cancelled by the DC2 code. The SI code can be specified at any column position on a line. When printing condensed characters, the line length is 132 columns. If the SO code is received after the SI code, condensed enlarged characters (double width of condensed characters) are printed. This condition is cancelled by a DC4 code or LF code, and the character size returns to "condensed".

EXAMPLE

```
10 LPRINT CHR$(15); "ABCDEFGH I J K L"
```

```
AB C D E F G H I J K L
```

DC 4 (Device Control 4)

The DC 4 code cancels the SO mode (enlarged character printing function).

EXAMPLE

```
10 LPRINT "ABC";CHR$(14);"DEF";
20 LPRINT CHR$(20);"GHI"
```

ABCDEFGHI

DC 2 (Device Control 2)

The DC 2 code cancels the SI mode (condensed character printing function).

NOTE:

The SO mode can be cancelled by the DC 4 code or LF code. The SI mode can only be cancelled by the DC 2 code.

```
10 LPRINT CHR$(15);"ABCDEF";
20 LPRINT CHR$(14);"GHI"
30 LPRINT CHR$(18);"JKLMN"
```

ABCDEFGHI
JKLMN

ESC E (for emphasized characters)

The ESC E code causes the printer to print all the data stored in the print buffer. The data following this code is printed in emphasized characters. Emphasized character printing gives the character a stronger impression on the paper. This code can be specified at any column position on a line.

The ESC F code cancels the emphasized character printing mode.

EXAMPLE

```
10 LPRINT CHR$(27);"E";"ABCDEF"
20 LPRINT CHR$(27);"F";"ABCDEF"
```

ABCDEF
ABCDEF

Control Codes

ESC G (for double printed characters)

The ESC G code causes the printer to print all the data stored in the printer buffer. The data following this code is printed in double print character mode. In this mode, the printer makes two complete passes over one line of printing. The paper is advanced about 1/216 inch between the first pass and the second pass.

ESC H

The ESC H code cancels the double print character mode.

EXAMPLE

```
10 LPRINT CHR$(27); "G"; "ABCDEFGHI"
20 LPRINT CHR$(27); "H"; "ABCDEFGHI"
```

ABCDEFGHI

ABCDEFGHI

ESC S + (n)D (for superscript and subscript characters) (n = 0 or 1)

The ESC S + (0)D code causes the printer to print all the data stored in the print buffer. The data following this code is printed in superscript character mode. In this mode, a character measuring 2.10 mm wide by 1.60 mm high is printed on the upper half of a line. The ESC S + (1)D code also prints all the data stored in the print buffer and then prints data in subscript character mode. In this mode, a character is printed at the lower half of a line.

In both the superscript and subscript character modes, the printer performs unidirectional, double character printing. After the first print head pass, the paper is advanced by 1/216 inch and a character is formed on completion of the second pass. The printer performs paper feeding adjustment to maintain the absolute length and number of lines of a page. Because of this adjustment subscript or superscript characters may, in the worst case, be printed improperly.

EXAMPLE

```

710 LPRINT CHR$(27);"E";
720 REM "For Double Print"
730 LPRINT "y=aX";CHR$(27);"F";
740 LPRINT CHR$(27);"S";CHR$(0);CHR$(15);
750 LPRINT "3";
760 LPRINT CHR$(27);"T";CHR$(18);
770 LPRINT CHR$(27);"E";
780 LPRINT CHR$(27);"H";
790 LPRINT "+bX";CHR$(27);"F";
800 LPRINT CHR$(27);"S";CHR$(0);CHR$(15);
810 LPRINT "2";
820 LPRINT CHR$(27);"T";CHR$(18);
830 LPRINT CHR$(27);"E";
840 LPRINT CHR$(27);"H";
850 LPRINT "+cX+d"
860 END

```

$$y=aX^3+bX^2+cX+d$$

ESC T

The ESC T code cancels the superscript/subscript character mode, but leaves the double print mode. To reset the double print mode, use the ESC H code.

ESC W + (n)D (for double-width enlarged character set/reset) (n = 0 or 1)

The ESC W + (1)D code causes all following data to be printed in double-width, enlarged characters. This code is cancelled by the ESC W + (0)D code. It cannot be cancelled by the DC4 code or the LF code).

The ESC W + (0)D code cancels the double-width enlarged character mode set by the ESC W + (1)D code. However, this code cannot cancel the enlarged character mode set by the SO code.

When the ESC W + (1)D code is used in the enlarged character mode, set by the SO code, or the SO code is used in the enlarged character mode, set by the ESC W + (1)D code, ESC W + (1)D takes precedence over SO. To cancel the enlarged character mode in this case, enter the ESC W + (0)D code.

Control Codes

EXAMPLE

```

800 LPRINT CHR$(27); "W"; CHR$(1); "abcdefg"
810 LPRINT CHR$(27); "W"; CHR$(0); "abcdefg"
820 LPRINT CHR$(27); "W"; CHR$(1); "stuvwxyz"
830 LPRINT CHR$(14); "CCC"
840 LPRINT CHR$(20); "DDD"
850 LPRINT CHR$(27); "W"; CHR$(0); "EEE"

```

```

abcdefg
abcdefg
stuvwxyz
CCC
DDD
EEE

```

ESC - (minus) + (n)D (for underline print mode set/reset)(n = 0 or 1)
 The ESC - (minus) + (1)D code places the printer in the underline print mode.
 All the data following this code is printed with an underline. The ESC -
 (minus) + (0)D code cancels the underline print mode.

```

10 REM Underline Mode
20 GOSUB 500
30 LPRINT CHR$(15);
40 GOSUB 500
50 LPRINT CHR$(18);
60 LPRINT CHR$(27); "E";
70 GOSUB 500
80 LPRINT CHR$(27); "F";
90 END
500 REM Underline subroutine
510 LPRINT "AAAA";
520 LPRINT CHR$(27); "-"; CHR$(1);
530 LPRINT "BBBB";
540 LPRINT CHR$(27); "-"; CHR$(0);
550 LPRINT "CCCC"
560 RETURN

```

```

AAAABBBBCCCC
AAAABBBBCCCC
AAAABBBBCCCC

```

OTHER CODES

ESC @ (Printer initialization)

The ESC @ code initializes the printer.

ESC 8 (ignore the Paper End Detector)

The ESC 8 code makes it possible to transmit data even if there is no paper in the printer. This allows data to be printed on the last page of the form.

ESC 9

This code cancels the ESC 8 condition. The printer cannot receive data when there is no paper.

BEL (Bell)

The BEL code is input, sounds the buzzer for about 0.3 seconds.

BS (Backspace)

The BS code prints the data stored in the print buffer and the buffer pointer is decremented by 1. The next character overstrikes the last character printed. In the enlarged character mode, BS is effective only for the last byte.

EXAMPLE 1

```
610 REM Back Space Example
620 LPRINT "YYYYYYYYYYY";
640 FOR I=1 TO 10
650 LPRINT CHR$(8);
660 NEXT I
670 FOR W=1 TO 10
680 LPRINT "=";
690 NEXT W
700 END
```

EXAMPLE 2

```
10 LPRINT "YYYYYYYYYYY";
20 LPRINT CHR$(27);"E";
30 LPRINT "YYYYYYYYYYY";
40 FOR I=1 TO 20
50 LPRINT CHR$(8);
60 NEXT
70 LPRINT"=====
80 END
```

YYYYYYYYYYY*****

NOTE:

In other than normal character mode, the BS code is in some cases ignored and may become invalid as shown in Example 2 above.

DEL (Delete)

The DEL code causes the last byte stored in the print buffer to be cleared.

EXAMPLE

```
500 REM Delete Example
510 LPRINT "*****";
520 FOR I=1 TO 10
530 LPRINT CHR$(127);
540 NEXT I
550 LPRINT "#####"
560 LPRINT "%%%%%"
570 END
```

```
#####
%%%%%
```

NUL (Null)

The NUL code terminates the tabulation setting sequence, unidirectional print mode, and underline mode. The lack of the NUL code causes incorrect data printout.

ESC K

The ESC K code, when used in the Text Mode, converts the printer's operation mode from Text to Normal-density Bit Image.

ESC L

The ESC L code, when used in the Text Mode, causes the printer to perform dual-density bit image printing.

ESC U + (n)D (n = 0 or 1)

The ESC U + (1)D code prints all the data following this code unidirectionally. The print head moves from left to right. Printing graphs and charts in the unidirectional printing mode assures more accurate printing start position with better printing quality.

The ESC U + (0)D code cancels the unidirectional printing mode.

ESC > (Most Significant Bit set)

The ESC > code indicates the most significant bit (MSB) of the 8-bit data item is read as 1.

ESC = (Most Significant Bit reset)

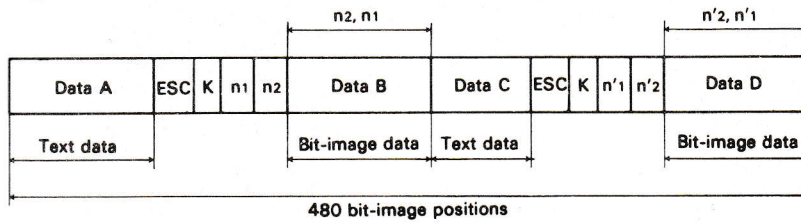
The ESC = code indicates the MSB of the next 8-bit data which is input after this code is read as 0.

ESC # (Most Significant Bit value unchanged)

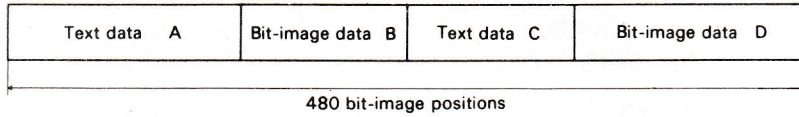
The ESC # code causes the MSB value of input data to remain unchanged.

EXAMPLE 2

Input Data



Printing



EXAMPLE 3: Bit image data transfer by BASIC program

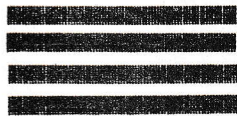
To check for proper conversion to the normal-density Bit Image mode, execute the following program.

EXAMPLE

```

100 REM Bit Image Printing (Normal Density)
110 LPRINT CHR$(27);"K";CHR$(80);CHR$(0);
120 FOR N=1 TO 80
130 LPRINT CHR$(255);
140 NEXT N
150 LPRINT CHR$(10);
160 GOTO 110

```

Dual-Density Bit-Image Mode

The ESC L + n₁ + n₂ code converts the printer's operation mode from Text to dual-density Bit Image. The transfer sequence of bit image data is the same as with ESC K (normal-density Bit-Image printing). The ESC L code produces two times the dot density in the horizontal direction as with ESC K. In other words, bit image data can be printed in 960 dot positions per line, producing denser graphic data.

Control Codes

EXAMPLE

```

100 REM Bit Image Printing
110 LPRINT CHR$(27); "L"; CHR$(80); CHR$(0);
120 FOR N=1 TO 80
130 LPRINT CHR$(255);
140 NEXT N
150 LPRINT CHR$(10);
160 GOTO 110

```

**NOTE:**

Normal-density Bit-Image, Dual-Density bit-image, and normal size characters in Text mode can all appear on the same line.

RELATIONSHIP BETWEEN DATA AND DOT WIRES

Figure 4-1 shows the relationship between the Bit-Image data and the dot wires in the print head. You have full program control over the eight dot wires in the print head.

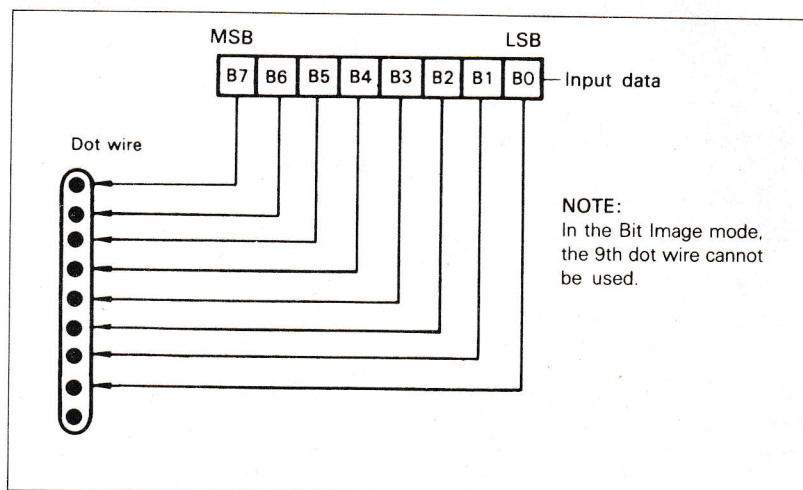
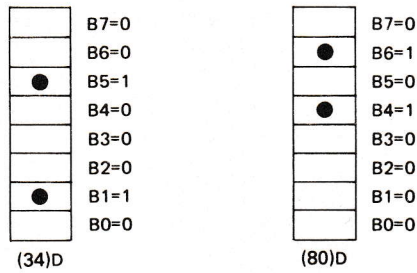


Figure 4-1 Relationship between Data and Dot Wires

Control Codes

If a bit is 1, the print head fires. If a bit is 0, the print head does not fire. For example, assume that data are given as follows;



Where a box with ● denotes the bit 1 and a blank box denotes the bit 0.

HOW TO OBTAIN n1 AND n2

In the Printer, you have to send the number of data by n1 + n2 in hexadecimal numbers following the ESC K or ESC L. If the number of bit image data is 300, then n1 and n2 may be derived as follows:

$$\begin{aligned}
 n1 &= (\text{Number of data}) \text{ MOD } 256 \\
 &= 300 \text{ MOD } 256 \\
 &= (44)\text{D}
 \end{aligned}$$

$$\begin{aligned}
 n2 &= \text{INT} (\text{Number of data}/256) \\
 &= \text{INT} (300/256) \\
 &= (1)\text{D}
 \end{aligned}$$

The data transfer sequence in the Bit Image mode is shown in Figure 4-2.

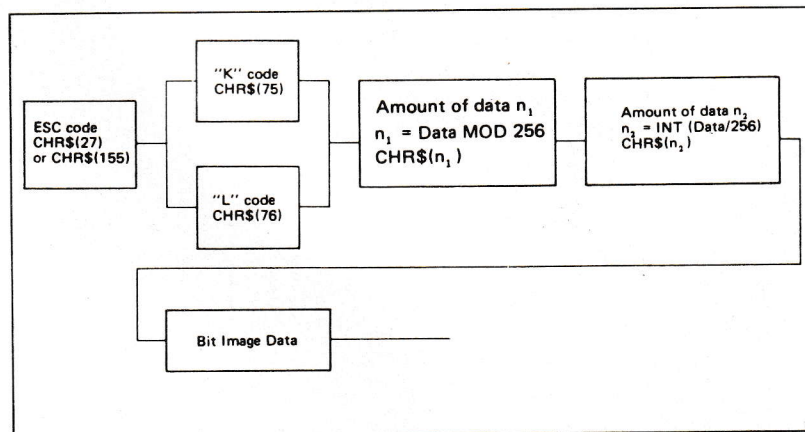


Figure 4-2 Data Transfer Sequence in Bit Image Mode

Control Codes

PROGRAMMING EXAMPLES

The example in Figure 4-3 shows a dual density Bit-Image pattern, and the decimal values that are used to print it.

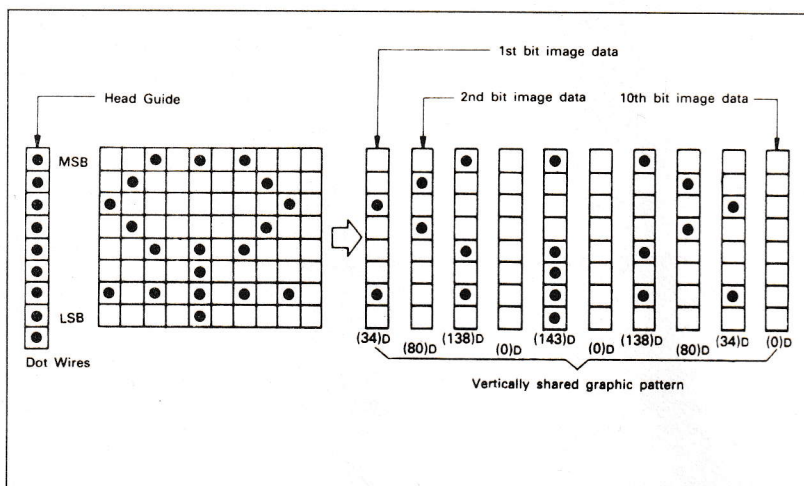


Figure 4-3 Example of Graphic Pattern Formation

NOTE:

The most significant bit (MSB) of the Bit-Image data corresponds to the dot wire at the uppermost position.

The design in Figure 4-3 would be programmed as shown in the following example.

EXAMPLE

```

10 REM Bit Image Printing (Dual Density)
20 LPRINT CHR$(27); "L"; CHR$(10); CHR$(128);
30 FOR I=1 TO 10
40 READ R
50 LPRINT CHR$(R);
60 NEXT
70 LPRINT
80 DATA 34,80,138,0,143,0,138,80,34,0
90 END

```

♀

Control Codes

The following program is for a pattern printed in normal-density Bit-Image mode.

EXAMPLE

```

10 REM Bit Image Printing (Normal Density)
20 LPRINT CHR$(27);"K";CHR$(12);CHR$(128);
30 FOR I=1 TO 12
40 READ R
50 LPRINT CHR$(R);
60 NEXT
70 LPRINT
80 DATA 4,10,26,58,103,231
90 DATA 231,103,58,26,10,4
100 END

```



In dual-density mode, the print dots overlap as shown in Figure 4-4.

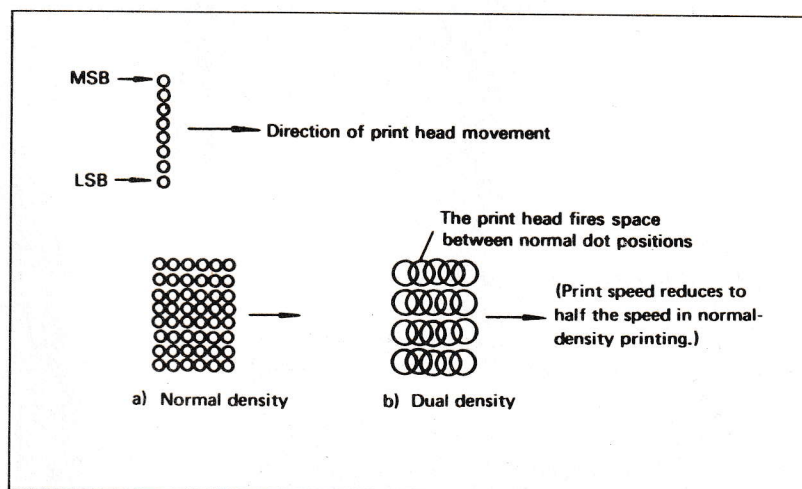


Figure 4-4 Normal-Density and Dual-Density Modes

NOTE:

The most accurate positioning of the paper is obtained using tractor feed rather than the friction feed.

Figure 4-5 shows how to produce various dot patterns using the Bit-Image mode.

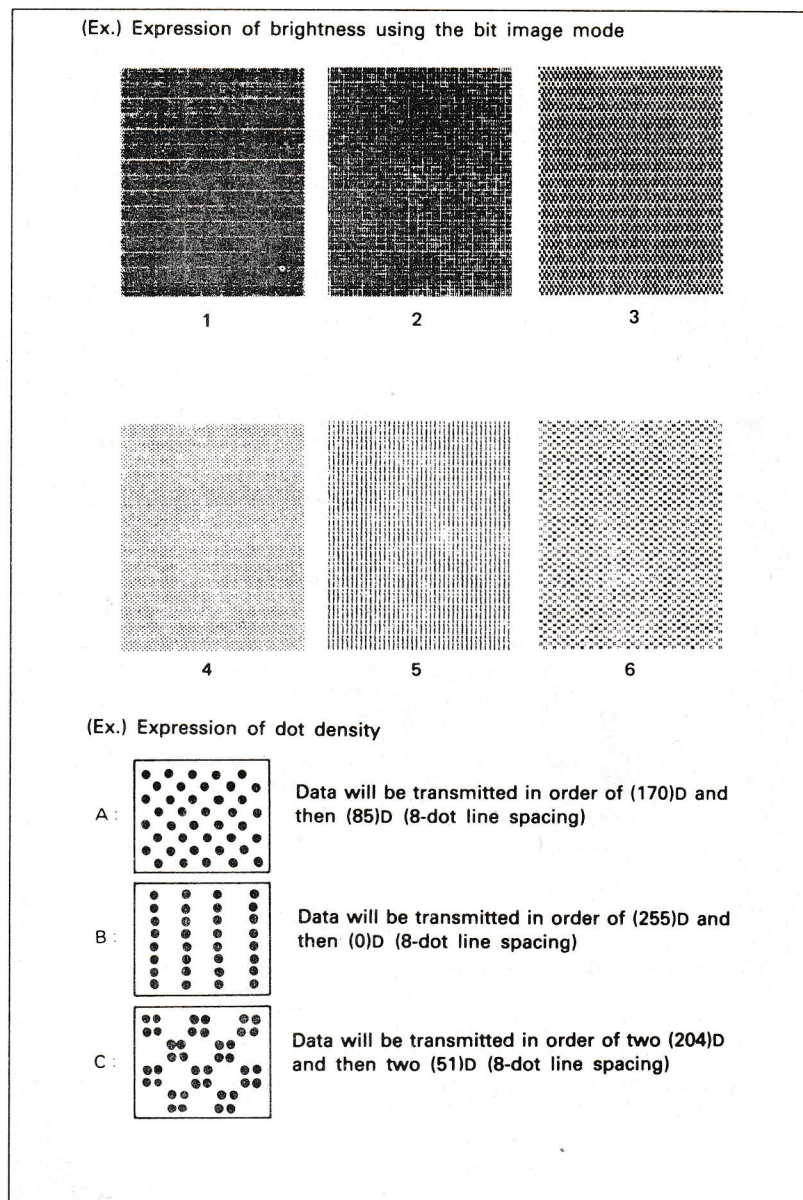


Figure 4-5 Dot Patterns

Control Codes

INKED RIBBON

Color	: Black
Type	: Cartridge
Life Expectancy	: 3 million characters
MTBF :	5x10 ⁶ lines (excluding print head)

ENVIRONMENTAL CONDITIONS

Operating Temperature Range	: 5° to 35°C (41° to 95°F)
Operating Humidity	: 10 to 80% noncondensing

POWER REQUIREMENTS

Voltage	: 115V, 60Hz 220/240V, 50Hz
Current	: 1 Amp maximum (115V)
Power Consumption	: 100 VA maximum

PHYSICAL CHARACTERISTICS

Height	: 133 mm (5.2 in.)
Width :	374 mm (14.7 in.)
Depth :	305 mm (12.0 in.)
Weight	: 7.0 kg (15.4 lbs.)

Specifications subject to change without notice.

APPENDIX B MAINTENANCE

PREVENTIVE MAINTENANCE

Preventive maintenance for the Printer consists of periodic cleaning. The Printer should be cleaned with a soft brush to remove paper dust and particles after every three months of use. The exterior surface of the Printer can be cleaned by using a mild detergent and water solution.

NOTE:

Do not use hard cloth or volatile solvents such as thinner or alcohol when cleaning around the print head. Otherwise, printed characters may not be impressed on the paper or may become dim, or a break may occur in the printed character.

PARTS REPLACEMENT

- . General
Operator's troubleshooting is limited to certain easily recognizable symptoms and cures. If a Printer malfunction other than the print head unit should occur, the operator should contact a Wang Service Representative.
- . Print head
In case of print head trouble or worn dot wires, replace the print head unit as described below, and shown in Figure B-1.

NOTE:

Wait until the print head cools before replacing it.

1. Turn the power off.
2. Take off the Printer lid and ribbon cartridge.
3. Turn the head lock lever clockwise and remove the print head.

Maintenance

4. Pull the head cable out straight while steadying the head connector on the terminal board.
5. Put a new head on the carriage assembly and replace the head lock lever.
6. Insert the head cable into the head connector carefully.

NOTES:

Inadequate connection may cause malfunctioning of the head.

The carriage assembly should not be moved without the print head mounted on the carriage.

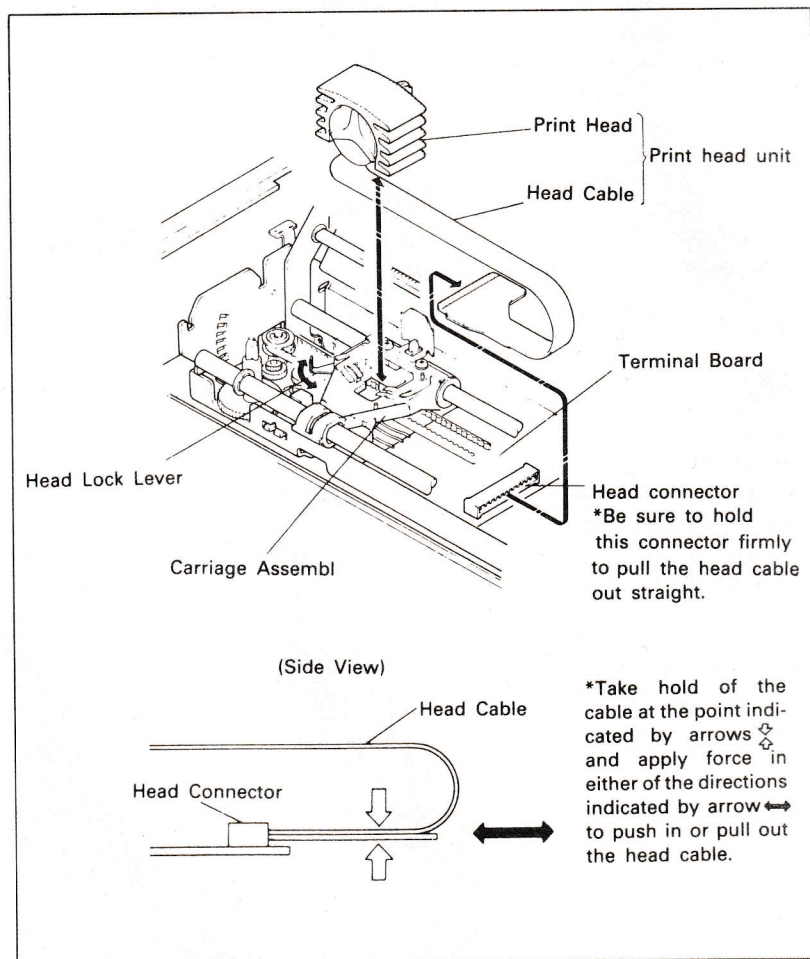


Figure B-1 Replacing the Print Head

REPORTING A PRINTER PROBLEM

The Wang PC Assistance Center located in Lowell, MA. supports a toll-free phone line from 8:30am to 5:30pm, Monday through Friday, EST. By calling 1-800-343-1098, you can receive answers to questions about your printer. The Assistance Center can help solve any problems you develop while unpacking, connecting, or using the printer.

Refer to Chapter 1 in the Wang Professional Computer Introductory Guide for warranty information, plus a description of the product support services available for your Wang Daisy Printer.

APPENDIX C DESIGN FEATURES

The Printer consists of three major functional blocks.

- . Printer Mechanism
- . Control Circuit Board
- . Power Circuit

PRINTER MECHANISM

The user replaceable print head contains 9 dot wires that form 9 by 9 dot matrix characters. The printer contains two stepper motors, both under control of the Type 8041 CPU located on the circuit board.

The head carriage stepper motor moves the print head to the next print column position. The CPU stops the print head at the last printing position. The processor then seeks the shortest travel path to the next print line.

One complete rotation of the paper feed stepper motor corresponds to 1/3 inch paper advance. You can select paper feed length by use of the printer control codes.

CONTROL CIRCUITS

The printer control circuit diagram is shown in Figure C-1.

POWER CIRCUIT

The power circuit generates 5V DC for the logic circuits, and 24V DC to operate the two stepper motors and the print head solenoids.

PRINTER INITIALIZATION

Initialization takes place automatically each time the primary AC power source is interrupted and reapplied by turning the Power Switch off and on. Initialization can also be initiated programmably upon input of the ESC @ code.

The following sequence of events takes place in the printer during initialization.

1. The print head returns to its home position.
2. The printer is automatically placed ON-LINE, unless it is out of paper.
3. The print buffer is cleared.
4. The line spacing is set at 1/6 inch .
5. The column length is set to 80.
6. The operation mode reverts to the Text mode.

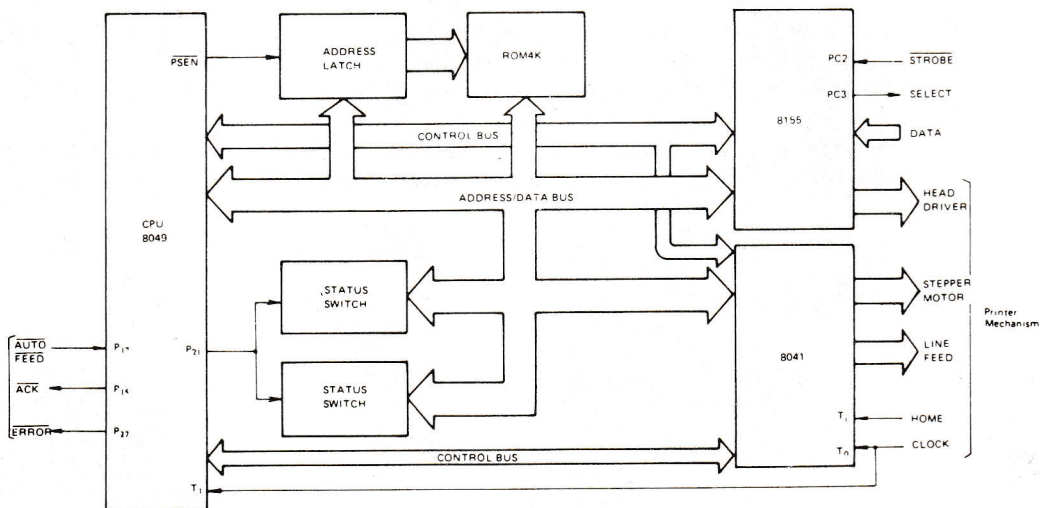


Figure C-1 Control Circuit Diagram

Design Features

APPENDIX D CHARACTER CODES FOR MATRIX PRINTER

The printable characters are shown in Table D-1, together with the corresponding hex codes. Table D-2 contains the names of the characters, plus the decimal values for use in print programs.

Table D-1 Characters and Hexadecimal Codes

	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
0				0	@	P	`	p								
1			!	1	A	Q	a	q	E		à	ù	ü	Þ	á	£
2			"	2	B	R	b	r			â	ú	í	Ë	â	¥
3			#	3	C	S	c	s			ä	ï	î	Ï	ÿ	¥
4			\$	4	D	T	d	t			å	í	ï	À	↓	¥
5			%	5	E	U	e	u	S	ı	æ	í	ï	Ó	ó	¥
6			&	6	F	V	f	v	r	ı	ä	í	ï	Ü	ü	À
7			'	7	G	W	g	w		ı	±	ı	ı	Ú	ú	À
8			(	8	H	X	h	x		ı	±	ı	ı	Û	û	À
9			)	9	I	Y	i	y		ı	±	ı	ı	Ü	ü	À
A		*	:	J	Z	j	z		ı	ı	±	ı	ı	°	×	Æ
B		+	;	K	[	k					ı	ı	ı	²	→	Ç
C		,	<	L	\	l				ı	ı	ı	ı	³	•	È
D		-	=	M	]	m				ı	ı	ı	ı	•	À	É
E		.	>	N	^	n		~		ı	ı	ı	ı	§	ß	Ê
F		/	?	O	_	o				ı	ı	ı	ı	¶	·	Ë

Table D-2 Character Names and Corresponding Codes

DEC	HEX	CHR	DEC	HEX	CHR	DEC	HEX	CHR	DEC	HEX	CHR	DEC	HEX	CHR	DEC	HEX	CHR
32	20	Space	64	40	@ Sign	96	60	Open Quote	128	A0	Blank	160	C0	g hacc	192	E0	thorn
33	21	!	65	41	A	97	61	a	129	A1	a grave	161	C1	i j ligature	193	E1	eth
34	22	"	66	42	B	98	62	b	130	A2	a acute	162	C2	dotless i	194	E2	y acute
35	23	#	67	43	C	99	63	c	131	A3	a umlaut	163	C3	i circumflex	195	E3	s cedilla
36	24	\$	68	44	D	100	64	d	132	A4	a tilde	164	C4	i grave	196	E4	Down Arrow
37	25	%	69	45	E	101	65	e	133	A5	E umlaut	165	C5	i acute	197	E5	u circumflex
38	26	&	70	46	F	102	66	f	134	A6	a angstrom	166	C6	i umlaut	198	E6	u grave
39	27	'	71	47	G	103	67	g	135	A7	plus/minus	167	C7	l ligature	199	E7	u acute
40	28	(	72	48	H	104	68	h	136	A8	ae ligature	168	C8	n tilde	200	E8	u umlaut
41	29	)	73	49	I	105	69	i	137	A9	c cedilla	169	C9	o circumflex	201	E9	Left Arrow
42	2A	*	74	4A	J	106	6A	j	138	AA	Inv Exclam.	170	CA	o grave	202	EA	Monetary
43	2B	+	75	4B	K	107	6B	k	139	AB	Inv Question	171	CB	o acute	203	EB	Right Arrow
44	2C	,	76	4C	L	108	6C	l	140	AC	e circumflex	172	CC	o umlaut	204	EC	o superior
45	2D	-	77	4D	M	109	6D	m	141	AD	e grave	173	CD	o tilde	205	ED	a circumflex
46	2E	Slash	78	4E	N	110	6E	n	142	AE	e acute	174	CE	oe ligature	206	EE	Beta
47	2F	Zero	79	4F	O	111	6F	o	143	AF	e umlaut	175	CF	slashed o	207	EF	dot
48	30	One	80	50	P	112	70	p	144	B0	G Hacc	176	DD	THORN	208	FF	Pound Sterling
49	31	Two	81	51	Q	113	71	q	145	B1	I J Ligature	177	D1	ETH	209	F1	Florin
50	32	Three	82	52	R	114	72	r	146	B2	Dotless I	178	D2	y acute	210	F2	1/2
51	33	Four	83	53	S	115	73	s	147	B3	I Circumflex	179	D3	S Cedilla	211	F3	3/4
52	34	Five	84	54	T	116	74	t	148	B4	I Grave	180	D4	A Acute	212	F4	A Circumflex
53	35	Six	85	55	U	117	75	u	149	B5	I Acute	181	D5	U Circumflex	213	F5	A Grave
54	36	Seven	86	56	V	118	76	v	150	B6	I Umlaut	182	D6	U Grave	214	F6	A Umlaut
55	37	Eight	87	57	W	119	77	w	151	B7	LL Ligature	183	D7	U Umlaut	215	F7	A Angstrom
56	38	Nine	88	58	X	120	78	x	152	B8	N Tilde	184	D8	A Tilde	216	F8	A Umlaut
57	39	Colon	89	59	Y	121	79	y	153	B9	O Circumflex	185	D9	A degree	217	F9	AE Ligature
58	3A	Semicolon	90	5A	Z	122	7A	z	154	BA	O Grave	186	DA	cent	218	FA	C Cedilla
59	3B	Less Than	91	5B	Left Bracket	123	7B	Left Brace	155	BB	O Acute	187	DB	a superior	219	FB	E Circumflex
60	3C	Equal Sign	92	5C	Back Slash	124	7C	Vertical Bar	156	BC	O Umlaut	188	DC	bullet	220	FC	E Grave
61	3D	Greater Than	93	5D	Right Bracket	125	7D	Right Brace	157	BD	O Tilde	189	DD	section	221	FD	E Acute
62	3E	Question	94	5E	Up Arrow	126	7E	Approximate	158	BE	OE Ligature	190	DE	Paragraph	222	FE	DELETE
63	3F		95	5F	Underscore	127	7F	DELETE	159	BF	Slashed O	191	DF		223	FF	

DEC=DECIMAL
HEX=HEXADECIMAL
CHR=CHARACTER

Character Codes for Matrix Printer

APPENDIX E
MAJOR CONTROL CODES

Control Code	Hex	Dec	Function	Ref. Page
NUL	00	0	NULL. Ends tab setting. Follows ESC C and ESC D.	4-17
BEL	07	7	BELL. Sounds buzzer for about 0.3 seconds.	4-16
BS	08	8	Backspace. The data stored in the buffer is printed and the buffer pointer is decremented by one.	4-16
DEL	7F	127	Clears the last data byte in the print buffer	4-17
HT	89	137	Horizontal Tabulation.	4-4
LF	0A	10	Line Feed.	4-3
VT	0B	11	Vertical Tabulation.	4-4
FF	0C	12	Form Feed. Advances paper to next Top of Form.	4-4
CR	0D	13	Carriage Return.	4-3
SO	0E	14	Shift Out. Turns on the enlarged character printing mode.	4-11
SI	0F	15	Shift In. Turns on the condensed character printing mode.	4-11
DC2	12	18	Turns off the condensed character printing mode.	4-12
DC4	14	20	Turns off the enlarged character printing mode.	4-12
ESC	1B	27	Escape. ASCII code for Escape. Precedes number and alphabets etc.	4-1
ESC 0	30	48	Sets line spacing to 8 lines per inch.	4-6
ESC 1	31	49	Sets line spacing to 7/72 in. per line.	4-7
ESC 2	32	50	Sets line spacing to 6 lines per inch.	4-7
ESC 3	33	51	Sets line spacing to n/216 in. per line.	4-7
ESC 8	38	56	Disables paper end detector.	4-16
ESC 9	39	57	Enables paper end detector.	4-16
ESC A	41	65	Sets line spacing between a range from 1/72 in. to 85/72 in.	4-5
ESC C	43	67	Sets form length.	4-8
ESC D	44	68	Sets HT up to 28 positions.	4-4
ESC E	45	69	Turns on emphasized character printing mode.	4-12
ESC F	46	70	Turns off emphasized character printing mode.	4-12

Control		Dec	Function	Ref. page
Code	Hex			
ESC G	47	71	Turns on double character printing mode.	4-13
ESC H	48	72	Turns off double character printing mode.	4-14
ESC J	4A	74	Sets line spacing to n/216 in. per line.	4-10
ESC K	4B	75	Turns on normal-density Bit-Image mode.	4-17
ESC L	4C	76	Turns on dual density Bit-Image mode.	4-17
ESC N	4E	78	Sets skip-over perforation.	4-9
ESC O	4F	79	Cancel skip-over perforation set.	4-9
ESC Q	51	81	Sets a column length.	4-5
ESC S	53	83	Turns on superscript/subscript mode.	4-13
ESC T	54	84	Turns off superscript/subscript mode.	4-14
ESC U	55	85	Starts or ends unidirectional printing.	4-17
ESC W	57	87	Turns on or off the enlarged character printing mode.	4-14
ESC -	2D	45	Turns on or off the underlined printing mode.	4-15
ESC @	40	64	Initializes printer	4-16
ESC	3C	60	Home head	4-4
ESC	3E	62	Read MSB of 7-bit data as 1	4-17
ESC=	3D	61	Read MSB of 8-bit data as 0	4-17
ESC #	23	35	Retain MSB value unchanged	4-17

APPENDIX F

USE OF MIXED PRINTING MODES

	Normal	Enlarged	Condensed	Superscript/ subscript	Doubled character	Emphasized	Italic	Underlined
Normal		○	○	○	○	○	○	○
Enlarged	○		○	x(1)	○	○	○	○
Condensed	○	○		○	○	x(3)	○	○
Superscript/subscript	○	x(1)	○		x(2)	x(4)	○	○
Doubled	○	○	○	x(2)		○	○	○
Emphasized	○	○	x(3)	x(4)	○		○	○
Underlined	○	○	○	○	○	○	○	

○: May be mixed

x: Either of the two modes is ignored if mixed. (See Notes (1) to (4) below.)

NOTES:

1. When character designation codes for the superscript/subscript mode and the enlarged character mode are mixed on the same line, superscript or subscript characters are not printed. However, only enlarged characters are printed unidirectionally from the left to right in the double character printing mode.
2. In the superscript/subscript character mode, the printer performs unidirectional, double-character printing. Even if the double-character printing mode is specified again by the ESC G code, the ESC G code is ignored.
3. When condensed character mode and emphasized character mode are mixed on the same line, the condensed character mode is ignored and only emphasized character are printed.
4. Similar to (1) above, the superscript/subscript character mode is ignored and only emphasized characters are printed in the unidirectional, double character mode.

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Title THE WANG PC MATRIX PRINTER USER MANUAL

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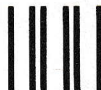
Dept/Mail Stop _____ State/Country _____

Company _____ Zip Code _____ Telephone _____

Thank you for your help.

WANG

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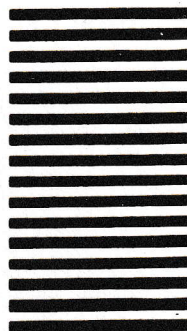


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**WANG LABORATORIES, INC.
CHARLES T. PEERS, JR., MAIL STOP 1363
ONE INDUSTRIAL AVENUE
LOWELL, MASSACHUSETTS 01851**



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The completed order form should be mailed to:

WANG LABORATORIES, INC.
Supplies Division
51 Middlesex St.
No. Chelmsford MA 01863

To Order by Phone, Call:

(800)225-0234

From Mass., Hawaii, and Alaska

(617)256-1400**TELEX 951-743****Order Form for Wang Manuals and Documentation**

① Customer Number (If Known) _____				
② Bill To: _____			Ship To: _____	
_____			_____	
_____			_____	
_____			_____	
③ Customer Contact: _____			④ Date _____	
_____			Purchase Order Number _____	
Phone _____			Name _____	
⑤ Taxable <input type="checkbox"/> ⑥ Tax Exempt Number _____ ⑦ Credit This Order to _____				
Yes <input type="checkbox"/> A Wang Salesperson _____				
No <input type="checkbox"/> Please Complete Salesperson's Name _____ Employee No. _____ RDB No. _____				
⑧ Document Number	Description	Quantity	⑨ Unit Price	Total Price
⑩ _____ Authorized Signature _____ Date _____ <input type="checkbox"/> Check this box if you would like a free copy of the Corporate Publications Literature Catalog (700-5294)			Sub Total	
			Less Any Applicable Discount	
			Sub Total	
			Local/State Tax	
			Total Amount	

Ordering Instructions

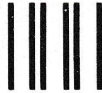
1. If you have purchased supplies from Wang before, and know your Customer Number, please write it here.
2. Provide appropriate Billing Address and Shipping Address.
3. Please provide a phone number and name, should it be necessary for WANG to contact you about your order.
4. Your purchase order number and date.
5. Show whether order is taxable or not.
6. If tax exempt, please provide your exemption number.
7. If you wish credit for this order to be given to a WANG salesperson, please complete.
8. Show part numbers, description and quantity for each product ordered.
9. *Pricing extensions and totaling can be completed at your option; Wang will refigure these prices and add freight on your invoice.*
10. Signature of authorized buyer and date.

Wang Supplies Division Terms and Conditions

1. **TAXES** — Prices are exclusive of all sales, use, and like taxes.
2. **DELIVERY** — Delivery will be F.O.B. Wang's plant. Customer will be billed for freight charges; and unless customer specifies otherwise, all shipments will go best way surface as determined by Wang. Wang shall not assume any liability in connection with the shipment nor shall the carrier be construed to be an agent of Wang. If the customer requests that Wang arrange for insurance the customer will be billed for the insurance charges.
3. **PAYMENT** — Terms are net 30 days from date of invoice. Unless otherwise stated by customer, partial shipments will generate partial invoices.
4. **PRICES** — The prices shown are subject to change without notice. Individual document prices may be found in the Corporate Publications Literature Catalog (700-5294).
5. **LIMITATION OF LIABILITY** — In no event shall Wang be liable for loss of data or for special, incidental or consequential damages in connection with or arising out of the use of or information contained in any manuals or documentation furnished hereunder.

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FIRST CLASS PERMIT NO. 16 NO. CHELMSFORD, MA.

POSTAGE WILL BE PAID BY ADDRESSEE

WANG LABORATORIES, INC.
Supplies Division
c/o Order Entry Dept.
M/S 5511
51 Middlesex St.
No. Chelmsford, MA 01863



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Preventive Maintenance

It is recommended that Wang equipment be serviced quarterly. A maintenance agreement is available to ensure this servicing automatically. If no maintenance agreement is acquired, servicing must be arranged by the customer. A maintenance agreement not only protects the customer's investment, but also provides the following benefits:

- **Preventive Maintenance** — The equipment is inspected for worn parts and is lubricated, cleaned, and updated with any engineering changes on a quarterly basis. Preventive maintenance minimizes "downtime" by anticipating repairs before they are necessary.
- **Fixed Annual Cost** — When the customer buys a maintenance agreement, only one purchase order needs to be issued for an entire year of service, and only one bill will be received. More frequent billing can be arranged, if desired.

Further information regarding maintenance agreements can be acquired from the local Sales Service office.

NOTE

Wang Laboratories, Inc., does not guarantee or honor maintenance agreements for any equipment modified by the customer. Damage to equipment incurred as a result of such modification becomes the financial responsibility of the customer.

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